ICT in Open Distance Learning: Issues and Challenges

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Formal Education
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ABSTRACT

Information and Communication Technology (ICT) is playing a vital role in open and distance learning (ODL) to meet the requirements and expectations of the learners' in large scale. It is difficult to perform the same using any traditional institutional system due to its limited resources. ICT has various proven tools and technologies to meet the requirements of a learner at various phases of learning cycle viz the admission phase, the learning phase, the evaluation phase and finally the certification phase as a service. Due to heterogeneous requirements in open distance learning, there are issues and challenges that are to be addressed in usage of the technology and the service(s) being provided through ICT. The paper emphasizes   the issues and challenges on the computing & network infrastructure, portability with respect to hardware & software and various learner support services. The paper also presents on security issues of a service in terms of its availability, authenticity, confidentiality and access control so that one can ensure a service to the utmost satisfaction of a learner in open distance learning system.

Keywords

Open distance leaning, ICT, availability, access control, confidentiality

1.0 INTRODUCTION

In distance learning system, learners are remote to the institution and are in large scale. It is difficult for a learner to visit the institution every day to get a service/support as available in a conventional system and at same time, it is even difficult to the institution itself to provide various services to the learners at different phases of a student learning life cycle, due to limited human resource available.   Information and Communication Technology (ICT) is a prime resource to overcome such limitations.

Information and communication technology is group of technologies by which various support services[1][3]shall be provided at different phases of student learning life cycle in distance learning. The various phases are the admission phase (progamme details, fee structure, admission procedure and registration & re-registration), the learning phase (learning schedule, programme delivery(lectures through video conferencing, webinars, audio & video programmes, multimedia presentations and case studies), the evaluation phase (examination schedule, internal &external assessment, examinations, improvement, valuation, revaluation and result declaration) and the certification phase (marks/grades updates, certificate printing & issuing and convocation schedule).

In conventional system, learners are able to interact with one another face-to-face, which is a prerequisite to more meaningful social intercourse. Since, there is no such facility in the distance learning, web-based student learning and support system shall be developed and implemented using ICT to provide services at all different phases in student learning life cycle and also for knowledge and information sharing as done in a conventional system of education.

2.0 ICT INFRASTRUCTURE IN OPEN DISTANCE LEARNING

Open distance learning system requires ICT infrastructure to provide various services effectively at different phases of a student life cycle. The ICT infrastructure include the network

infrastructure, the computing infrastructure, the system and application software, the Internet Service Provider(ISP), the bandwidth, the policy framework and the security infrastructure.

The network infrastructure

The institution, that provides education in open distance learning mode requires a structured network at all its operational nodes (headquarters, the regional and study centres in case of IGNOU) and interconnected each other through a dedicated network so that all student services can be accessed easily by all operational nodes, students and other public. The network shall include adequate and standard network components that are used at gateway and other parts of the structured network. The standard network components are the router, the network switches, the standard network cable (fiber and UTP). Wireless connectivity(Wifi/Wi-max) shall also be used, where ever needed.

The computing infrastructure

The standard computing infrastructure include standard computer hardware such as servers(database servers, web servers, backup/recovery servers and application servers) to host various student learning and support services and personal computers (desktop computers, laptops and net books) to access and use services.

The stable system and application software

The system and application software is required to develop software for various student learning and support services that are needed at various phases of student learning life cycle. The software is a main component in open distance learning by which various support services shall be provided to students and other public in large scale. The present Web technologies support to develop web-based software for various services that can be accessed any where and any time. Web technologies broadly categorized as LAMP(Linux, Apache, MySQL and PHP) and WAMP(Windows, Apache, MySQL and PHP). There are several learning management systems(LMS) available and MOODLE is one of popular LMSs. LMS is a complete system that covers all phases of a student learning life cycle.

The internet service provider(ISP) and internet bandwidth

Internet bandwidth is needed to access web-based student learning and support services. The amount of internet bandwidth required is directly proportional to the number of users, who access the service(s) and is one of the parameters to access a service easily with no time . The accessibility of a service depends on the availability of internet bandwidth reserved in a particular institution, where service is hosted. The internet service provider is an organization who provides internet bandwidth.

The security infrastructure

Security infrastructure is essentially required to protect the systems(servers and personal computers), software, applications and the data that are being used in an institution, where student learning and support services are made available in open distance learning system. Security infrastructure enhance the security of a System/Application/data and are intended to counter security attacks. The gateway(the starting and ending point for inbound and outbound traffic) of systems shall be protected with security devices. The standard security devices are the firewall, intrusion detection system(IDS), intrusion prevention system(IPS), the antivirus software and other monitoring systems. Security for a service shall be ensured by protecting its network domain where service is running, its system domain on which the service is hosted and the service/application itself. Each security device shall be configured with proper access controls.

The policy document

Policy document covers various policies that are to be enforced in an institution where student learning and support services are made available in a open distance learning system. The policies shall broadly categorized to operational policies, behavioral policies, resource access(system, service and network) control policies, security policies and organizational policies. The policy document is dynamically changed based on need and deed. The policy document helps to setup the ICT infrastructure properly and to have access control.

3.0 THE CHALLENGING ISSUES OF ICT INFRASTRUCTURE SETUP & USAGE IN ODL

Information and communication technologies playing a prime role in supporting various services in open distance learning in large scale and at same time there are many issues and challenges[4] in setup and usage of ICT infrastructure. The following are various issues and challenges:

Application/service compatibility with respect to the computer hardware and software

Technology is changing very frequently, but it is difficult every time to develop application software for various services using such technology. New technology has always flexible features that are needed in ODL system to meet the demands of the learners in large scale, but it is a challenging task to choose ideal hardware and software that have compatibility with existing application software. Application compatibility with respect to hardware and software can be achieved by placing platform independent infrastructure(the hardware, software and application).

Scalability issues

Open distance learning is a more flexible education system than any other conventional education system. Due to this, the student enrollment is very high and at same time expectations from learners also high. As learners are more in scale and remote to the institution, most of the activities being performed remotely through the online services that are provided by the institution. Since, the learners and their usage is increasing progressively, time to time ,it is a challenging issue to maintain always scalable resources in terms of memory space, handle number of users and their transactions. This issue can be addressed by anticipating the scalable load at network level, system level, application/service level and data storage level at least for a period of 5 to 7 years and place an adequate computing, storage and network infrastructure.

Ensure data compatibility

As database technology is changing time to time, ensuring data compatibility with changing database technology is a challenging task. If the old data is not compatible with new database technology, it is very difficult to use and access data through various services/applications. Data compatibility problem can be achieved by encouraging data migration process in various stages time to time so that the data is always compatible to new database technology to use and access it all the times.

Dynamic allocation of Internet bandwidth

Dynamic allocation of internet bandwidth to a specific service is a challenging issue. The accessibility of a service shall be ensured only with the availability of internet bandwidth as it is one of the prime parameters. As allocation of internet bandwidth to a specific service is directly proportional to the amount of usage of that service, there is a need of dynamically allocation of bandwidth time to time to that service. The problem can be achieved by introducing bandwidth management and load balancing system to ensure availability of a service. As online services are essential in ODL, it is ideal to have more than one ISP so that the availability of a service can be ensured always.

Policy updates

Due to flexibility in open distance learning system, there will be frequent changes in admission criteria, evaluation criteria and even in learning procedure and policies to be adopted accordingly. As there is a frequent change in policies, it is a difficult task to update the policies every time, but if policy updation has not been done in time, it leads to many other operational problems. This issue can be addressed by introducing dynamic policy updation and enforcement approach in open distance learning system.

Dedicated network connectivity among various operational nodes

In open distance learning system, learners are remote to the institution in many ways and getting services through one of its operational nodes (the headquarters, regional and study centres in case of IGNOU). It is a difficult to have proper network connectivity among various operational nodes to provide/access services due to non availability of technical manpower. This problem can be achieved by establishing dedicated network connectivity among various operational nodes in form of intranet by using MPLS/VPN technology.

Support services

In open distance learning system, learners are remote to the institution many ways and require various online support services to perform their activities. Since ODL is a flexible system, the operational policies need to be changed frequently and is difficult to provide updated support services in time due to laps at various levels in the system. This problem can be addressed by involving all related personnel at the time of initiation of an activity so that   its impact, if any on existing services can be discussed and find timeframe to provide support services in time.

Manpower inline with change in technology

As technology is frequently changing time to time, it is a difficult task to have updated manpower inline with change in technology. It is even very difficult to have such manpower in government organizations. This problem can be achieved by introducing brainstorming and counseling sessions time to time and also to impart training/workshops on change in technology time to time.

4.0 SECURITY IN OPEN DISTANCE LEARNING

In open distance learning, many online learning and support services are made available to its learners and other public. As usage of services is increasing day by day, at same time hackers/attackers are playing a vital role to deny the service and damage system resources. Security is essential   to protect the resources from hackers and in turn protect the sensitive information and data.

Hackers take advantage of different security flaws in a network service, hosting infrastructure and exploit the vulnerability to compromise the system. The following are various security flaws by which a hacker will play a role:

• Lack of proper hardening of Servers
• Insufficient network boundary security controls
• Flaws or bugs in application/service software
• Insecure design and coding of hosted software (OS, application, etc)
• Weak passwords
• Social engineering
• Lack of operational control

Security of a system/service/data shall be ensured by protecting the sensitive resources[2] at network, system and the application/service domains. Some of the security parameters are authentication, access control, availability, confidentiality, integrity and non-repudiation. Violation in any of the parameter leads a breach in security. All these security parameters to be enforced along with security policy on the ICT infrastructure being used in open distance learning. The following are some of the policies to be framed and implemented for smooth functioning of ICT infrastructure in open distance learning system:

- Network security policy
- Host/ Server security policy
- Application software security
- Database security
- Content management policy
- Web server logging policy
- Backup a policy
- Password management policy
- Encryption policy
- Audit, Incident handling and Recovery policy
- Physical security policy

5.0 CONCLUSION

It is true that ICT is playing a vital role in open distance learning but at same time there are many issues and challenges that are to be addressed for smooth functioning of various online services that are to be implemented for its learners and other public. In this paper, the required ICT infrastructure and various issues and challenges in usage and setting up of ICT infrastructure in open distance learning are addressed. The institution that is providing education in ODL mode should look at   all the addressed issues and challenges and take necessary precautions with a proper action plan along with timeframe.

REFERENCES

[1] A. Murali M Rao, 2009, ' Web-enabled User Support Services System in Distance Learning', Proceedings of International Conference on Interaction Sciences: Information Technology, Culture and Human(ICIS 2009), The ACM International Conference Proceeding, Vol I, ISBN 978-1-60558-710-3,Seoul, Korea, pp 86-90.
[2] A. Murali M Rao, 2010, 'Digital Library Security: A Layered Approach', Proceedings of International Conference on Digital Libraries(ICDL 2010), Volume 2, New Delhi, pp 1167-1171.
[3] Bernadette Robinson, 2008, 'Using distance education and ICT to improve access, equity and the quality in rural teachers' professional development in western China', International Review of Research in Open and Distance Learning, Volume 9, Number 1, Chaina.
[4] Sangay Jamtsho, 2005, 'Challenges of ICT use for distance learning support in Bhutan, ICDE International conference', New Delhi.